

Chesapeake Bay TMDL – Watershed Implementation Plan

Section 6: Wastewater

A. Wastewater Treatment Facilities

Element 1: Final Nutrient and Sediment Target Loads

Final, enforceable nutrient waste load allocations (WLA) have been adopted under State law and regulations promulgated in 2005-06 for Virginia's Bay wastewater treatment facilities, covering both municipal and industrial plants, and implementation is ongoing to comply with these requirements. Individual WLA were assigned to each of Virginia's 125 Bay watershed Significant Dischargers, and an allowance ("Permitted Design Capacity") for the XXX Nonsignificant Discharger's (271 municipal; XXX industrial) was included in 2005 legislation establishing the Nutrient Credit Exchange Program (VA Code §62.1-44.19:12). Further description of these regulated facilities is provided in Element 2.

In summary, the discharged and delivered nutrient and sediment load caps for Virginia's Bay watershed wastewater plants are as follows:

Table 6.A.1: **Significant Dischargers' Discharged and Delivered Total Nitrogen WLA**

Basin	TN WLA Discharged (million lbs/yr)	TN WLA Delivered (million lbs/yr)
Shen.-Potomac	5.16	To Be Determined*
Rappahannock	0.61	TBD
York	1.06	TBD
James	14.90	TBD
Eastern Shore	0.04	TBD
Total	21.77	TBD

Note: * Need revised delivery factors from Watershed Model Phase 5.3

Table 6.A.2: **Significant Dischargers' Discharged and Delivered Total Phosphorus WLA**

Basin	TP WLA Discharged (million lbs/yr)	TP WLA Delivered (million lbs/yr)
Shen.-Potomac	0.247	TBD
Rappahannock	0.046	TBD
York	0.173	TBD
James	1.354	TBD
Eastern Shore	0.002	TBD
Total	1.822	TBD

Table 6.A.3: **Significant Dischargers' Discharged and Delivered Total Suspended Solids WLA**

Basin	TSS WLA Discharged (million lbs/yr)	TSS WLA Delivered (million lbs/yr)
Shen.-Potomac	37.87	TBD
Rappahannock	4.74	TBD
York	10.25	TBD
James	61.20	TBD
Eastern Shore	0.25	TBD
Total	114.30	TBD

Table 6.A.4: **Nonsignificant Dischargers’ Discharged and Delivered Total Nitrogen WLA**

Basin	TN WLA Discharged ** (million lbs/yr)	TN WLA Delivered (million lbs/yr)
Shen.-Potomac	0.46 + TBD	TBD
Rappahannock	0.10 + TBD	TBD
York	0.13 + TBD	TBD
James	0.48 + TBD	TBD
Eastern Shore	0.03 + TBD	TBD
Total	1.20 + TBD	TBD

Note: ** Figures shown are calculated PDC for Nonsignificant Municipal Dischargers; additional loads for Nonsignificant Industrial Dischargers to be determined.

Table 6.A.5: **Nonsignificant Dischargers’ Discharged and Delivered Total Phosphorus WLA**

Basin	TP WLA Discharged ** (million lbs/yr)	TP WLA Delivered (million lbs/yr)
Shen.-Potomac	0.062 + TBD	TBD
Rappahannock	0.014 + TBD	TBD
York	0.017 + TBD	TBD
James	0.063 + TBD	TBD
Eastern Shore	0.004 + TBD	TBD
Total	0.160 + TBD	TBD

Table 6.A.6: **Nonsignificant Dischargers’ Disch. and Delivered Tot. Suspended Solids WLA**

Basin	TSS WLA Discharged ** (million lbs/yr)	TSS WLA Delivered (million lbs/yr)
Shen.-Potomac	0.742 + TBD	TBD
Rappahannock	0.175 + TBD	TBD
York	0.209 + TBD	TBD
James	0.797 + TBD	TBD
Eastern Shore	0.047 + TBD	TBD
Total	1.969 + TBD	TBD

The allowable annual TN, TP and TSS loads for each Significant Discharger are individually listed in Appendix X. For the Nonsignificant Dischargers’ PDC, the aggregate TN, TP and TSS loads are presented in Appendix Y, along with a listing of the permitted facilities that comprise these totals.

Element 2: Current Loading Baseline and Program Capacity

Program Capacity – The basis for the wastewater facilities’ WLAs is contained in Virginia Code (§62.1-44.19:12) and two regulations: Water Quality Management Planning Regulation (9 VAC 25-720) and Chesapeake Bay Watershed General Permit Regulation (9 VAC 25-820). These are enforceable provisions that “cap” the dischargers’ total nitrogen (TN), total phosphorus (TP) and sediment loads (TSS), and allow for nutrient credit exchange to achieve compliance.

For the purpose of assigning nutrient and sediment WLAs, the Bay wastewater facilities are designated either as “Significant” or “Nonsignificant Dischargers”. These two classifications include both municipal and industrial facilities and are defined in State regulation as follows:

“Significant discharger” means (i) a point source discharger to the Chesapeake Bay watershed with a design capacity of 0.5 million gallons per day or greater, or an equivalent load; (ii) a

point source discharger to the Chesapeake Bay watershed downstream of the fall line with a design capacity of 0.1 million gallons per day or greater, or an equivalent load; (iii) a planned or newly expanding point source discharger to the Chesapeake Bay watershed that is expected to be in operation by 2010 with a permitted design of 0.5 million gallons per day or greater, or an equivalent load; or (iv) a planned or newly expanding point source discharger to the Chesapeake Bay watershed downstream of the fall line with a design capacity of 0.1 million gallons per day or greater, or an equivalent load, that is expected to be in operation by 2010. (9 VAC 25-720-10)

"Nonsignificant discharger" means (i) a sewage treatment works discharging to the Chesapeake Bay watershed downstream of the fall line with a design capacity of less than 0.1 million gallons per day, or less than an equivalent load discharged from industrial facilities, or (ii) a sewage treatment works discharging to the Chesapeake Bay watershed upstream of the fall line with a design capacity of less than 0.5 million gallons per day, or less than an equivalent load discharged from industrial facilities. (9 VAC 25-820-10)

Under State law, the Nonsignificant Dischargers were given a "Permitted Design Capacity", which is defined as follows:

"Permitted design capacity" or "permitted capacity" means the allowable load (pounds per year) assigned to an existing facility that is a nonsignificant discharger, that does not have a waste load allocation listed in 9VAC25-720-50 C, 9VAC25-720-60 C, 9VAC25-720-70 C, 9VAC25-720-110 C, and 9VAC25-720-120 C of the Water Quality Management Planning Regulation. The permitted design capacity is calculated based on the design flow and installed nutrient removal technology (for sewage treatment works, or equivalent discharge from industrial facilities) at a facility that has either commenced discharge, or has received a Certificate to Construct (for sewage treatment works, or equivalent DEQ approval for discharges from industrial facilities) prior to July 1, 2005. This mass load is used for (i) determining whether the expanding facility must offset additional mass loading of nitrogen and phosphorus and (ii) determining whether the facility must acquire credits at the end of a calendar year. For the purpose of this regulation, facilities that have installed secondary wastewater treatment (intended to achieve BOD and TSS monthly average concentrations equal to or less than 30 milligrams per liter) are assumed to achieve an annual average total nitrogen effluent concentration of 18.7 milligrams per liter and an annual average total phosphorus effluent concentration of 2.5 milligrams per liter. Permitted design capacities for facilities that, before July 1, 2005, were required to comply with more stringent nutrient limits shall be calculated using the more stringent values. (9 VAC 25-820-10)

Basically, Virginia's approach to control wastewater nutrient discharges applicable to the Bay TMDL is to adopt enforceable limits contained in discharge permits for both annual loads (Watershed General Permit) and annual average effluent concentrations (individual VPDES permits). Significant Dischargers are required to collectively achieve the total WLA delivered to tidal waters in their basin through installation of nutrient reduction technology (NRT) or use of the Credit Exchange Program. Nonsignificant Dischargers are capped at their PDC, with requirements to install NRT under any proposed future expansion. All new discharges or expansions beyond current WLA or PDC must be completely offset, with a number of options available to comply with this requirement.

When Virginia's point source nutrient discharge control regulations were adopted in late 2005, the annual TN and TP WLA for Significant Dischargers were based on a combination of total design flow and stringent NRT. The level of NRT applied to the regions of the Bay tributaries varied somewhat, in consideration of:

- delivery factors affecting loads discharged above the fall line and reaching tidal waters
- modeled water quality response and compliance with tidal water quality standards
- the combined size of the discharges and resulting loads
- available technology
- equivalent treatment in terms of comparable “level of effort” between municipal and industrial facilities

These assumed TN and TP annual average effluent concentrations were primarily* used to calculate WLA for Significant Dischargers:

Bay Tributary Region	Effluent TN Conc. (mg/l)	Effluent TP Conc. (mg/l)
Shenandoah and Potomac AFL	4.0	0.3
Potomac BFL	3.0	0.3
Rappahannock	4.0	0.3
York	6.0	0.7
James AFL	6.0	0.5
James Tidal Fresh	5.0	0.5
Lower James	8.0	1.0
Eastern Shore	4.0	0.3

Notes: “AFL” = above fall line; “BFL” = below fall line

* - existing, more stringent permit limits were unaffected, and there were exceptions (e.g., Combined Sewer Syetemlocalities, individual considerations for industrials)

WLA for Significant Dischargers are based on the Water Quality Management Planning Regulation (9 VAC 25-720) adopted in 2005 with subsequent amendments and contained in the Chesapeake Bay Watershed General Permit Regulation (9 VAC 25-820) adopted in 2006.

The current wastewater loading baseline, with earlier years presented to demonstrate progress achieved since the inception of the Chesapeake Bay Program, is presented in the following:

Table 6.A.7: VA Basin Loads – Wastewater Sector Delivered **Nitrogen** Loads (million lbs/year)

Basin	1985 TN Load	2002 TN Load	2009 TN Load	TN WLA
Shen.-Potomac	9.78	7.93	3.58	TBD
Rappahannock	0.61	0.58	0.45	TBD
York	1.43	1.21	1.17	TBD
James	24.72	16.09	14.67	TBD
Eastern Shore	0.35	0.21	0.15	TBD
Total	36.90	26.02	20.02	TBD

Table 6.A.8: VA Basin Loads – Wastewater Sector Delivered **Phosphorus** Loads (million lbs/year)

Basin	1985 TP Load	2002 TP Load	2009 TP Load	TP WLA
Shen.-Potomac	0.58	0.42	0.440	TBD
Rappahannock	0.20	0.10	0.080	TBD
York	0.46	0.17	0.130	TBD
James	4.17	1.73	1.080	TBD
Eastern Shore	0.05	0.03	0.003	TBD
Total	5.46	2.45	1.733	TBD

Table 6.A.9: VA Basin Loads – Wastewater Sector Delivered **TSS** Loads (million lbs/year)

Basin	1985 TSS Load	2002 TSS Load	2009 TSS Load	TSS WLA
Shen.-Potomac	TBD	TBD	TBD	TBD
Rappahannock	TBD	TBD	TBD	TBD
York	TBD	TBD	TBD	TBD
James	TBD	TBD	TBD	TBD
Eastern Shore	TBD	TBD	TBD	TBD
Total	TBD	TBD	TBD	TBD

Nutrient Credit Exchange Program - Virginia has a critical need under the TMDL to maintain the ability of dischargers to exchange or trade nutrient credits to comply with their WLA, as authorized under State law (VA Code §62.1-44.19:12). Trades are allowed among dischargers only within the same basin with one exception. The 2010 General Assembly amended the credit exchange law to allow facilities on the Eastern Shore to acquire credits from dischargers in the Potomac and Rappahannock basins. TMDL implementation must recognize that trades among segment-shed TMDLs within each river basin are permitted, so long as local water quality is protected and the basin's total WLA is achieved.

Continuing the flexibility afforded by the Credit Exchange Program will ensure the legislature's intent is met, supporting their finding and determination that *"...adoption and utilization of a watershed general permit and market-based point source nutrient credit trading program will assist in (a) meeting these cap load allocations cost-effectively and as soon as possible in keeping with the 2010 timeline and objectives of the Chesapeake 2000 Agreement, (b) accommodating continued growth and economic development in the Chesapeake Bay watershed, and (c) providing a foundation for establishing market-based incentives to help achieve the Chesapeake Bay Program's nonpoint source reduction goals"*.

Element 3: Accounting for Growth

EPA guidance for development of the Bay TMDL and Watershed Implementation Plans provides two approaches to account for growth:

- Designate explicit target loads in the TMDL for anticipated growth; this decreases allocations available for existing sources; OR,
- Do not designate explicit target loads for growth, but "offset" any new or increased loads in the future with reductions elsewhere.

Virginia Code and regulation provides for a combination of these approaches for wastewater:

- WLA set at 2010 design capacity of wastewater plants to recognize planning and investment made to provide treatment for future growth into the foreseeable future.
- Regulatory nutrient caps call for offsetting new loads from future expansions of existing wastewater plants.
- VA Code calls for no allocation provided for new wastewater plants:
 - 2005 legislation: this applies only to new plants larger than 40,000 gpd
 - 2010 legislation: this applies only to new plants larger than 1,000 gpd

The current Significant Dischargers' WLA and Nonsignificant Dischargers' PDC have some built-in growth allowances, being based on total design flow and either measured or assumed concentrations that are less stringent than limit of technology. A recent review of the Compliance Plans submitted annually by the dischargers subject to the Chesapeake Bay Watershed General Permit shows that nutrient credits are expected to be available over the next 5 to 10 years. This is

due to a combination of the municipal plants currently using only about 65% of their design capacity and several plants being upgraded with NRT that exceeds the performance basis of their WLA. As basin caps are approached into the future, additional facilities will need to install more stringent NRT treatment, as well as explore options such as reclamation/reuse and point to nonpoint source trading.

Element 4: Gap Analysis

Current Virginia law, regulation and permits generally provide the assurance needed to meet the wastewater nutrient target loads. Legislation passed in 2010 provided two new authorities:

- HB1290: Eastern Shore facilities can acquire credits from facilities in the Potomac and Rappahannock basins.
- HB1135: New dischargers (greater than 1,000 gpd but less than 39,999 gpd) commencing discharge after January 1, 2011, must offset their nutrient loads.

However, there are some minor “gap” issues in the existing regulations that could be addressed. For example, the 2010 legislation doesn’t cover existing plants with a design flow less than 40,000 gpd that are expanding but will still be under 40,000 gpd. Also not addressed are smaller, new municipal wastewater systems under 1,000 gpd and industrial plants below 40,000 gpd. The possibility for legislative or regulatory amendments to resolve these issues will be evaluated as implementation under the Bay TMDL proceeds, further described in the next element.

Element 5: Commitment and Strategy to Fill Gaps

Wastewater dischargers in the Bay watershed operate under both individual discharge and Watershed General permits; the Commonwealth’s overall commitment of ensuring compliance is through administration and enforcement of these permits.

- Options for existing small dischargers expanding to under 40,000 gpd:
 - Consider seeking legislation to set allocations based on existing design capacity; future expansions would be treated like other Nonsignificant Dischargers that need to offset beyond existing capacity; or,
 - Assign allocation to each of these discharges based on 40,000 gpd; this will use more of the existing allocation compared to first option.
- Options for small dischargers less than 1,000 gpd (SFH, Single Family Homes) and new industrial dischargers less than 40,000 gpd:
 - Provide allocations in TMDL for all existing and new SFH under 1,000 gpd and industrial dischargers less than 40,000 gpd; or,
 - Consider seeking legislation requiring new SFH and industrial facilities less than 40,000 gpd to secure offsets for all of their discharged loads. This option for SFH could be coordinated with the approach used for controlling new loads from on-site septic systems and provide for entities (e.g., local government or other third party) to coordinate such an offset program on behalf of homeowners.

Element 6: Tracking and Reporting Protocols

In general, Bay wastewater dischargers are required to track and report under their discharge permits, both the Watershed General Permit for annual loads and individual permits for concentration-based nutrient limits.

The specifics of annual reporting by dischargers under the Watershed General Permit are:

- On or before February 1 each year, the permittee shall either individually or through the Virginia Nutrient Credit Exchange Association file a report with DEQ. The report shall identify:
 - The annual mass load of total nitrogen and the annual mass load of total phosphorus discharged by each of its permitted facilities during the previous calendar year;
 - The delivered total nitrogen load and delivered total phosphorus load discharged by each of its permitted facilities during the previous year; and
 - The number of total nitrogen and total phosphorus credits for the previous calendar year to be acquired or eligible for exchange by the permittee.

As mentioned previously, all dischargers under the Watershed General Permit are also required to annually submit to DEQ, either individually or through the Virginia Nutrient Credit Exchange Association, an update to their compliance plans for approval. The compliance plans must contain any capital projects and implementation schedules needed to achieve total nitrogen and phosphorus reductions sufficient to comply with the individual and combined waste load allocations of all the dischargers in the tributary as soon as possible.

As part of the Nutrient Credit Exchange Program, DEQ is required to report results of wastewater nutrient monitoring and credit availability by April 1 of each year for the prior year's annual loads. Then, on or before July 1 each year DEQ must publish notice of all nutrient credit exchanges and purchases for the previous calendar year and make all documents relating to the exchanges available to any person requesting them.

Element 7: Contingencies for Slow or Incomplete Implementation

DEQ's Compliance and Enforcement Program for wastewater permit requirements is the mechanism that will be employed to ensure timely implementation to achieve waste load allocations.

- Contingency: Offsets Among Source Sectors
 - Assessing compliance with 2-year milestones will be based upon total loadings, not by compliance with individual source sector allocations.
 - Wastewater treatment plants can operate below their assigned allocations:
 - During early years, treatment efficiency is better while wastewater flows are below the design capacity.
 - Meeting permitted nutrient concentrations is attainable using installed technology and are typically operated at levels below the limits to ensure compliance.
 - Excess "credits" from the wastewater sector can be used to offset loads in other sectors that exceed their allocations; this will aid in meeting the Commonwealth's overall target load for the 2 year milestone period.

Element 8: Appendix with Detailed Targets and Schedule

Wastewater targets loads will be included in the TMDL for the segment-shed where the facility is located; there are 40[?] segment-sheds in Virginia.

The compliance period for all affected facilities discharging into Virginia's Bay tributaries, for both TN and TP WLA, begins January 1, 2011.

B. Combined Sewer Systems (CSS)

Element 1: Final Nutrient and Sediment Target Loads

Figures reflect full implementation of approved Combined Sewer Overflow (CSO) Long Term Control Plans for each locality; data provided by the Virginia CSS Working Group (localities) and their consultants.

Table 6.B.1: Combined Sewer System Discharged and Delivered Total Nitrogen WLA

Locality and Load Type	TN WLA Discharged (lbs/yr)	TN WLA Delivered (million lbs/yr)
Alexandria CSS (1)	5,767	5,767
Alexandria S.A. CSS (2)	5,152	5,152
Lynchburg CSS (3)	63,169	TBD
Richmond CSS (4)	326,413	326,413
Total	400,501	TBD

Notes:

- (1) Based on model-predicted 1993-1995 CSO discharge volume and Alexandria CSO event mean concentrations (EMCs) of 5.88 mg/L TN, 0.78 mg/L TP, and 70.5 mg/L TSS.
- (2) Based on model-predicted 1993-1995 CSS wet weather flow treated and discharged at the Alexandria Sanitation Authority WWTP, and ASA WWTP permit limits of 3.0 mg/L TN, 0.18 mg/L TP, and 6.0 mg/L TSS.
- (3) The CSO component of the CSS WLA is based on relating 1993-95 modeled impervious area runoff from the Richmond CSS to the Lynchburg CSS (adjusted based on current service areas and rainfall differences). The WWTP component of the CSS WLA is based on 1993-95 wet weather flow treated and discharged at the Lynchburg WWTP. CSO EMCs of 8.0 mg/L TN, 1.0 mg/L TP, and 130 mg/L TSS are used for the CSO component of the CSS WLA. WWTP full treatment concentrations of 8.0 mg/L TN, 0.5 mg/L TP, and 30.0 mg/L TSS for wet weather flow conditions are used for the WWTP component of the CSS WLA.
- (4) Includes model-predicted CSO and CSS wet weather flow treated and discharged by the Richmond WWTP. CSO EMCs of 8.0 mg/L TN, 1.0 mg/L TP, and 130 mg/L TSS are used for the CSO component of the CSS WLA. WWTP full treatment concentrations of 8.0 mg/L TN, 0.5 mg/L TP, and 30.0 mg/L TSS for WWF conditions are used for the WWTP component of the CSS WLA.

Table 6.B.2: Combined Sewer System Discharged and Delivered Total Phosphorus WLA

Locality and Load Type	TP WLA Discharged (lbs/yr)	TP WLA Delivered (million lbs/yr)
Alexandria CSS (1)	765	765
Alexandria S.A. CSS (2)	309	309
Lynchburg CSS (3)	6,188	TBD
Richmond CSS (4)	28,389	28,389
Total	35,651	TBD

Table 6.B.3: Combined Sewer System Discharged and Delivered Total Suspended Solids WLA

Locality and Load Type	TSS WLA Discharged (lbs/yr)	TSS WLA Delivered (million lbs/yr)
Alexandria CSS (1)	69,148	69,148
Alexandria S.A. CSS (2)	10,304	10,304
Lynchburg CSS (3)	684,834	TBD
Richmond CSS (4)	3,806,922	326,413
Total	4,571,208	TBD

Element 2: Current Loading Baseline and Program Capacity

Element 3: Accounting for Growth

Element 4: Gap Analysis

Element 5: Commitment and Strategy to Fill Gaps

Element 6: Tracking and Reporting Protocols

Element 7: Contingencies for Slow or Incomplete Implementation

Element 8: Appendix with Detailed Targets and Schedule

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